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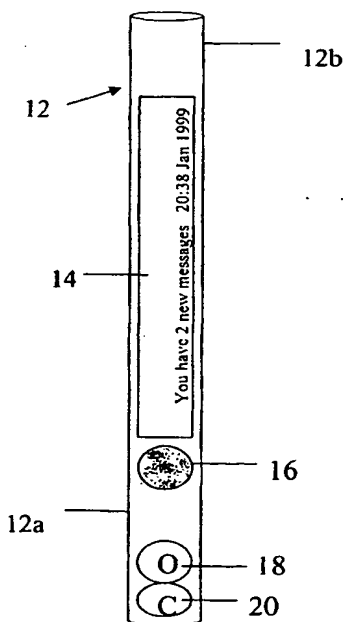
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(54) Title: DISPLAY DEVICE



(57) Abstract: A display device comprising a stick-shaped housing holdable in one hand and a screen, made from cholestric liquid crystal material, extendable from the housing to provide a display for the user.

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Display Device

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a display device.

2. Description of the Related Art

10 In known portable devices including displays, a balance always has to be struck between portability and usability. For example, currently, a notebook PC is too big to be conveniently carried, although the display is adequate. Whereas, a palmtop computer is small enough to be carried unobtrusively, but the user has to
15 put up with a small display.

SUMMARY OF THE INVENTION

20 With this in mind, according to one aspect, the present invention may provide a display device comprising a stick-shaped housing holdable in one hand, and an electronically-writeable screen extendable from the housing to provide a display for the user.

25 In this way, the present invention is able to provide a display which is very convenient to transport, yet provides an adequate screen when needed.

 Preferably, the display device includes a user control on the housing by which the user can adjust the degree to which the screen is extended.

30 This feature is advantageous in that it enables the user to extend the screen of display device to the extent permitted by the circumstances, whereby the display device may be used in even very cramped situations such as on commuter trains.

Preferably, the display device comprises a window formed in the housing through which a portion of the screen material is viewable when in its first position. The visible portion of the display can then
5 be used to display a limited amount of key information to the user, even when the display material is in its first position.

According to a further aspect of the invention, the present invention may provide a personal
10 communication device comprising a display device as hereinbefore discussed and a radio interface.

Other objects and features of the present invention will become apparent from the following detailed description considered in conjunction with the
15 accompanying drawings. It is to be understood, however, that the drawings are intended solely for purposes of illustration and not as a definition of the limits of the invention, for which reference should be made to the appended claims.

20

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, wherein like reference numerals delineate similar elements throughout the several views:

25 FIG. 1 shows an embodiment of the invention in the closed position;

FIG. 2 shows a longitudinal cross-section of the embodiment of FIG. 1;

30 FIG. 3 shows a cross-sectional view of the printed circuit board (PCB) shown in FIG. 2;

FIG. 4 shows a functional block diagram of electronic components of the FIG. 1 embodiment;

FIG. 5 shows the embodiment of FIG. 1 in a partly-opened position; and

FIGS. 6 and 7 show the embodiment of FIG. 1 in a fully-opened position.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

5 Referring to FIG. 1, a personal communication device 10 of the present invention comprises a stick-shaped housing, generally designated 12, which is sized to be conveniently held in one hand. The housing 12 has a first end 12a and a second end 12b, and is provided
10 longitudinally along the length thereof with a transparent window 14. At the first end 12a of the housing 12, a 5-position, roller-ball mouse 16, an 'open' button 18 and a 'close' button 20 are provided.

Referring to FIG. 2, within the housing 12 a
15 hexagonal printed circuit board (PCB) 22 is mounted. On the inside surface of the PCB 12, the circuitry 50 necessary to control the operation of the device is laid out. This circuitry 50 is closed from the volume surrounded by the PCB 12 by a component cover 23.
20 Within the volume enclosed by the component cover 23, a battery 24 for powering the device is located. The battery 24 is replaceable and can be removed from the second end 12b of the housing 12. Electronically-writeable screen material 26 is rolled around the PCB
25 22. The display material 26 can be cholestric display material, including cholestric liquid crystals. A motor 28 is mounted at the first end 12a of the housing 12. The motor 28 is coupled to the screen material 26.

Referring to FIG. 4, the circuitry 50
30 comprises a radio interface 52, including an internal antenna capable of both data reception and transmission; a motor driving unit 56 for driving the motor 28; a display driver 58 for writing to the screen material 26, for example, in accordance with U.S. Patent No. .

5,933,203, the disclosure of which is incorporated herein by reference; and a control unit 60 for coordinating the overall operation of the device, including directing the operation the radio interface 52, the motor driving unit 56 and the display driver 58. The control unit 60 is also responsive to the mouse 16, and open and close buttons 18 and 20, respectively.

Referring again to FIG. 1, the device 10 is in its standby mode in which the screen 26 is fully scrolled-up within the housing and only a small portion of the screen, hereinafter referred to as the window display, is visible through the window 14. The window display shows key information to the user. In this instance, the time and the fact that the device has received new messages. In the standby mode, the radio interface 52 maintains contact with a cellular network and can accept incoming messages.

When the user wishes to make active use of the device 10, he might, for example on a commuter train, chose to unscroll the screen to only the extent shown in FIG. 5 because the train is crowded. He does this by depressing the open button 18 for a predetermined duration. The button depression is detected by the control unit 60. While the key is depressed, the control unit 60, via the motor controller 56, drives the motor 28, thereby causing the screen portions 26a and 26b to be steadily unscrolled from the housing 12 and extend laterally from the housing. Once the open button is released, the unscrolling terminates. The material of the display may have sufficient rigidity itself to maintain its planar form as it is being unscrolled. With some display materials this may not be the case, and the material can be provided with a thin metal backing which can be rolled and unrolled with the screen

to impart the necessary structural rigidity. The backing may take the form, for example, of a thin border running around the edges of the screen or a framework extending over the back of the screen. It will be noted
5 that the height of the screen is less than that of the housing. The reason for this is to create a region at one end of the housing 12 by which the housing can be readily held by the user during the rolling out or rolling up of the screen without the screen interfering
10 with the user's hands. The buttons 18, 20 and the mouse 16 are positioned proximate to this end region.

On the left-hand screen portion 26a, the user is presented with a series of icons indicating the various services the device 10 supports and can access
15 over the air using its radio interface 52. As shown in FIG. 5, these include "newspaper", "internet", "email", "TV phone". By moving the screen cursor (not shown) using the mouse 16, the user is able to select the required service. The newspaper service accesses, over
20 the air via the internet or via a dedicated server, the user's regular newspaper. On the right hand screen 26b, there is shown weather forecast information. The device 10 formats the data it is displaying according to the current extent to which the screen is unscrolled. This
25 is very much like a Microsoft's Windows application, but, of course, in this case the physical display area actually varies.

By depressing the open button 18, the screen 26 can be unraveled to its maximal size. FIGS. 6 and 7
30 show examples of the device displaying various items of content downloaded over the air from the internet.

The two screen portions 26a, 26b can operate depending on the application to act as a single large display or two independent displays.

When the user wishes to stop using the device, he depresses the open button 20 for a predetermined duration. The button depression is detected by the control unit 60. While the key is depressed, the
5 control unit 60, via the motor controller 56, drives the motor 28, thereby causing the screen portions 26a and 26b to be steadily scrolled up and withdrawn into the housing 12.

It will be appreciated that the device is
10 particularly suited to downlink intensive applications where a decent-sized display is desirable. Because the device can be readily held by one hand, it is very useable in difficult environments. Yet at the same time, because the screen can be rolled up so
15 unobtrusively into the housing, the device is also extremely portable.

Thus, while there have been shown and described and pointed out fundamental novel features of the present invention as applied to a preferred embodiment thereof,
20 it will be understood that various omissions and substitutions and changes in the form and details of the devices illustrated, and in their operation, may be made by those skilled in the art without departing from the spirit of the present invention. For example, it is
25 expressly intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Substitutions of elements from one described
30 embodiment to another are also fully intended and contemplated. It is also to be understood that the drawings are not necessarily drawn to scale but that they are merely conceptual in nature. It is the intention,

therefore, to be limited only as indicated by the scope of the claims appended hereto.

CLAIMS

1. A display device comprising:

a stick-shaped housing holdable in one hand;

and

5 an electronically-writeable screen extendable
from the housing to provide a display for the user.

2. The display device of claim 1, further
comprising user control means by which the user can
10 adjust the degree to which the screen is extended.

3. The display device of claim 1, wherein
the screen is extendable from a first position in which
the screen is fully retracted within the housing, and a
15 second position in which the screen is maximally
extended from the housing.

4. The display device of claim 2, wherein
the screen is extendable from a first position in which
20 the screen is fully retracted within the housing, and a
second position in which the screen is maximally
extended from the housing.

5. The display device of claim 3, wherein
25 the screen comprises first and second screen portions
which are extendable in opposite directions from the
housing.

6. The display device of claim 4, wherein
30 the screen comprises first and second screen portions
which are extendable in opposite directions from the
housing.

7. The display device of claim 3, comprising a window formed in the housing through which a portion of the screen is viewable when in its first position.

5 8. The display device of claim 4, comprising a window formed in the housing through which a portion of the screen is viewable when in its first position.

9. The display device of claim 2, further
10 comprising motor responsive to the user control means for rolling out and rolling in the screen.

10. The display device of claim 1, further comprising a circuit board means arranged concentrically
15 around a major axis of the housing.

11. The display device of claim 10, further comprising battery means contained within a volume defined by the circuit board means.

20

12. A personal radio device comprising the display device of claim 1, further comprising a radio transceiver located within the housing.

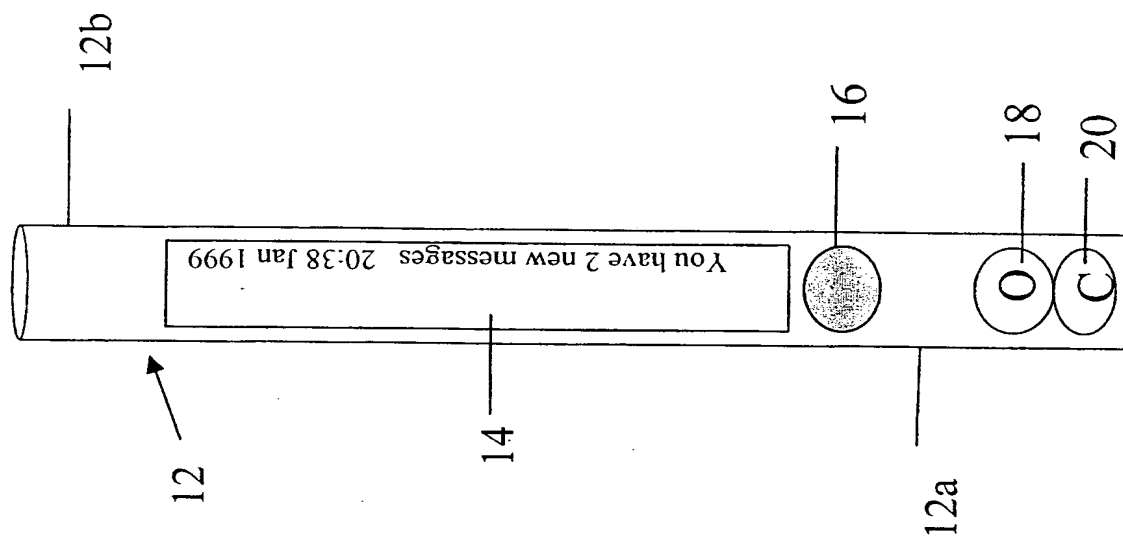


FIG. 1

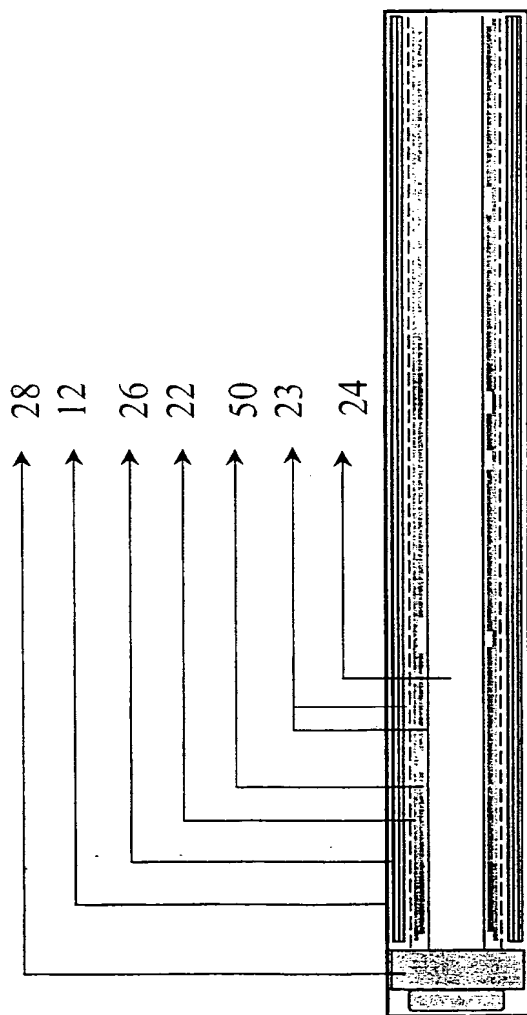


FIG. 2

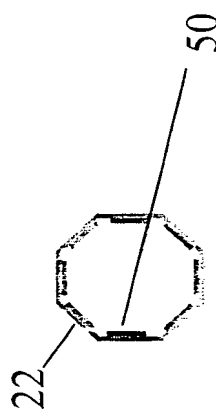


FIG. 3

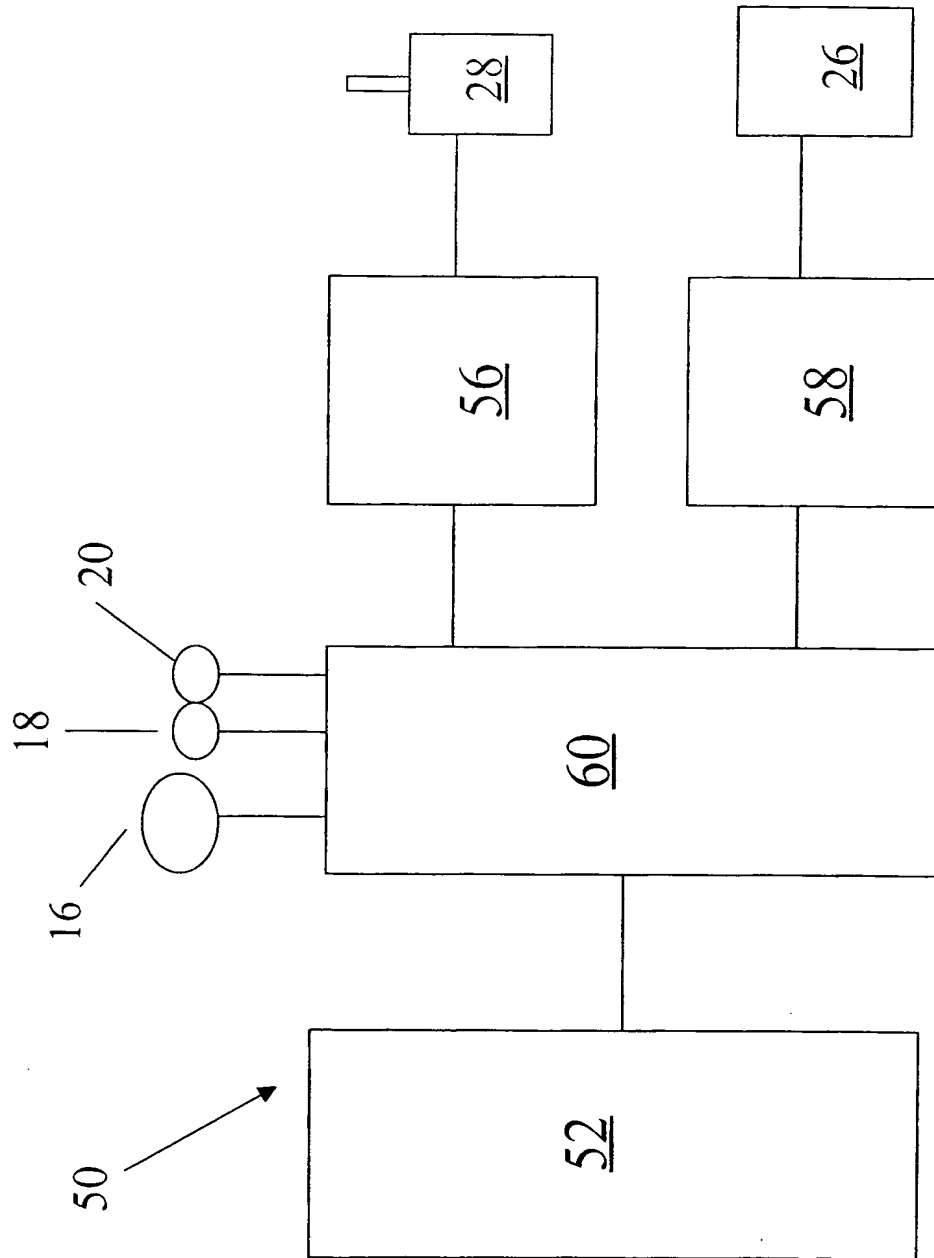


FIG. 4



FIG. 5

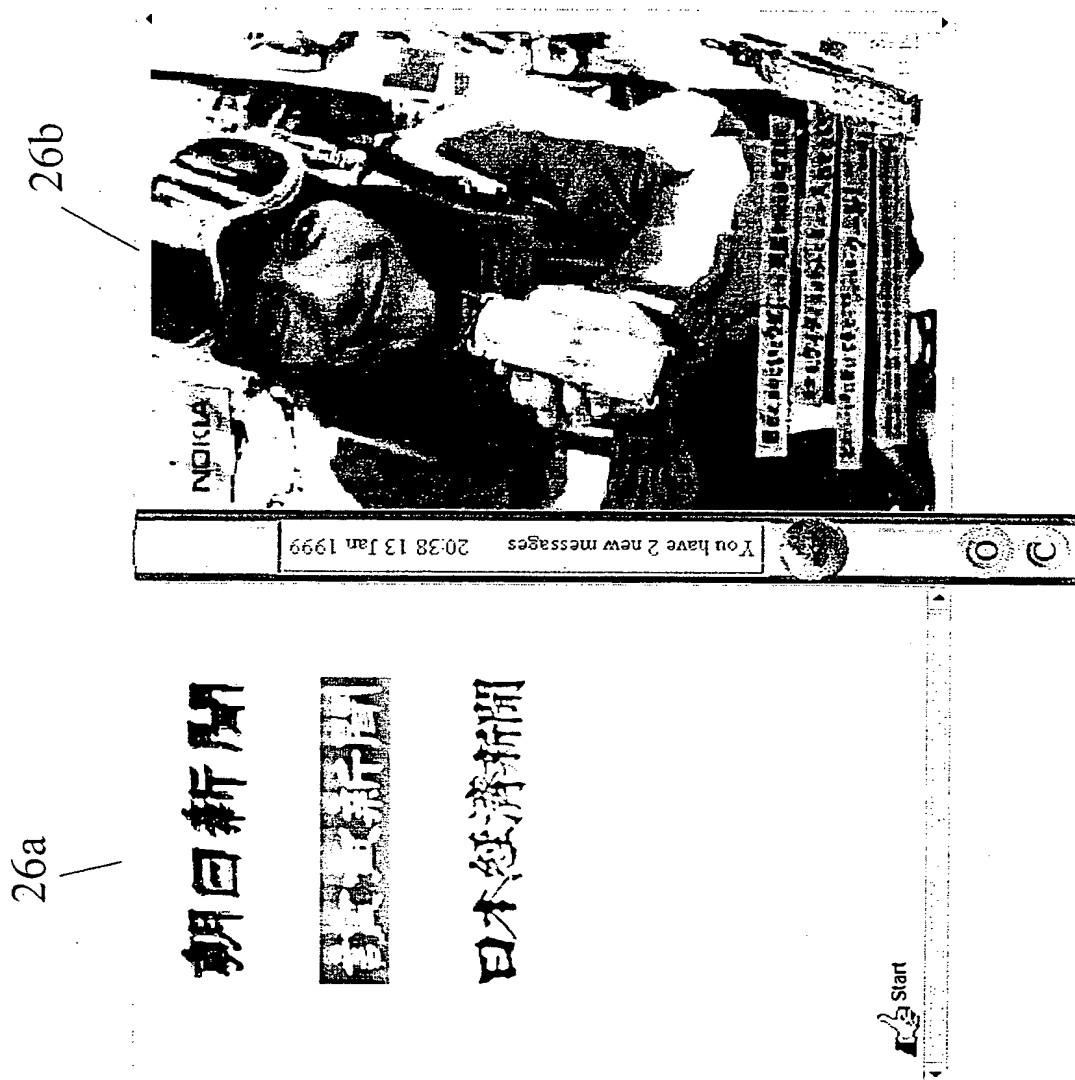


FIG. 6

26a

26b

2008年五輪の

日債銀救済

興銀和子に株中代表訴訟

東証平均株価: 1,79,392円66銭 (-99円83銭)
日相場: 114円72銭 (-1円20銭) 更新: 1999.2.6 17:03

世界最大の企業に

接待総額300万ドル

100人の国王葬儀

元百歳 中東和平当事者一堂に

Start

2008年五輪の大坂招致委が発足「オリンピックに活動」宣言

2008年五輪の大坂開催を目指す「大阪オリンピック招致委員会」が8日、発足した。開催地が決定する2011年5月の国際オリンピック委員会（IOC）総会に向け、国内外でのPRに乗り出す。委員会は、東京に敗れた日本でも開催の希望を五輪に、しかし、IOCをめぐって競合する招致活動への懸念が絶えず、今後、活動には世界の厳しい目が注がれる。招致活動は遠征にあたり、「五輪宣言」を採り、五輪をめぐってオリンピックに招致活動を推進する」と、奥の意を表明した。設立総会には、大阪市長、大阪府知事、大阪府議会議員、大阪府内各団体の代表が出席し、大阪市内のホテルで午後5時過ぎから開かれた。会場には大阪市長、会場には新宮

関西経済連合会会長を連立。副会長には日本オリンピック委員会（JOC）の古橋が連立会長や大阪府立大学工学部所長が副会長、各委員は、大阪府知事、大阪府議会議員、大阪府内各団体の代表が出席し、大阪市内のホテルで午後5時過ぎから開かれた。会場には大阪市長、会場には新宮

FIG. 7

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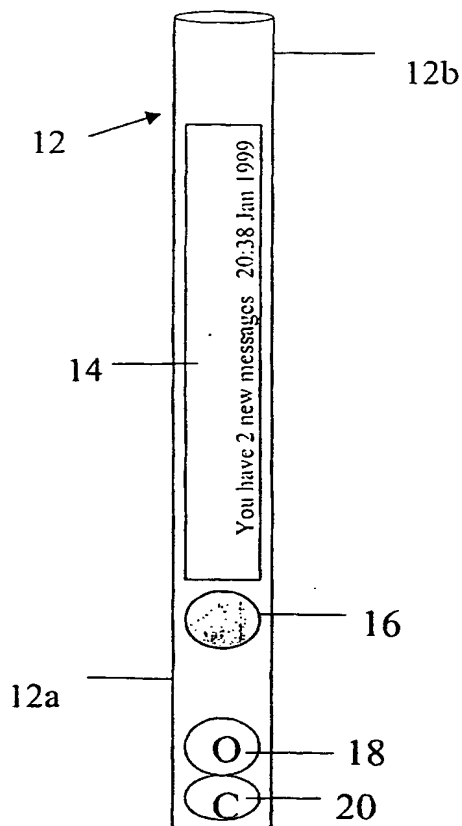
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- (22) International Filing Date:
22 December 2000 (22.12.2000) (74) Agent: **STUART, Michael, C.**; Cohen, Pontani, Lieberman & Pavane, Suite 1210, 551 Fifth Avenue, New York, NY 10176 (US).
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- (71) Applicant: **NOKIA CORPORATION** [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).
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[Continued on next page]

(54) Title: COLLAPSIBLE DISPLAY DEVICE



(57) Abstract: A display device comprising a stick-shaped housing holdable in one hand and a screen, made from cholestric liquid crystal material, extendable from the housing to provide a display for the user.

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INTERNATIONAL SEARCH REPORT

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PCT/IB 00/01963

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06F1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 03962 A (JUNKYARD DOGS LTD) 29 January 1998 (1998-01-29) page 14, line 3 -page 15, line 15 figures 12A,14,15	1-4,9
A	EP 0 424 074 A (FAILLA STEPHEN J) 24 April 1991 (1991-04-24) column 18, line 31 -column 20, line 31 figures 46-52	1-4,9,12
A	EP 0 776 140 A (NOKIA MOBILE PHONES LTD) 28 May 1997 (1997-05-28) column 3, line 3 -column 5, line 5 column 9, line 21-40 figures 4,5	1,12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

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- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

5 July 2001

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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